**American Journal of Quantum Chemistry and Molecular Spectroscopy**
2019; 3(1): 1-5
http://www.sciencepublishinggroup.com/j/ajqcms
doi: 10.11648/j.ajqcms.20190301.11

**Short Communication**

# Greening Cold Fusion as an Energy Source for Water Treatment Distillation - A Perspective

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**To cite this article:**
Djamel Ghernaout. Greening Cold Fusion as an Energy Source for Water Treatment Distillation - A Perspective. *American Journal of Quantum Chemistry and Molecular Spectroscopy.* Vol. 3, No. 1, 2019, pp. 1-5. doi: 10.11648/j.ajqcms.20190301.11

**Received**: July 13, 2019; **Accepted**: August 4, 2019; **Published**: August 16, 2019

**Abstract:** This paper presents the concept of using energy generated from the cold fusion process in water treatment distillation. Even if solar energy remains the greenest one, the huge energy liberated from the cold fusion phenomenon suggests its utilization in the distillation process to gain energetic efficiency in terms of cost and time. Ten years ago, cold fusion specialists announced that they possess solid proof that ambient temperature fusion is genuine. Throughout employing the concept of cold fusion, the power plants possess distinctive benefits over the still hypothetical thermonuclear fusion. With a large success, compact cold fusion set-ups will be utilized on ships, in aircrafts, and in near and outer space travels. That, in principle, is inaccessible for the giant thermonuclear installations. For using cold fusion in water treatment industry, this is only an idea presented at its birth stage. Great work remains to be accomplished with a view to present the cold fusion process as an eco-friendly technology for producing energy for water treatment distillation. In fact, greening cold fusion as an energy source for water treatment distillation may be considered as a promising perspective. However, the term "greening" means here a process without any nuclear hazards and inherent pollutions.

**Keywords:** Cold Fusion, Distillation, Water Treatment, Energy Source, Drinking Water

## 1. Introduction

Russell [1] suggested that the previously published test by Chambers et al. [2] characterizing 5.1 MeV tritons in an unambiguous quantification has intense insinuation concerning the type of the cold fusion operation [3-6]. In this test, a beam of 300 to 1000 eV deuterons impinged on a thin (1 µm) film of titanium. Rising charged reaction products were detected via a silicon particle detector [7-9]. Throughout masking part of the detector with another foil, the identity of the particles could be unambiguously determined from the range-energy correlation (Figure 1). Moreover, the particles were specified via measuring the detector peak shift with no bias voltage. The test findings are that only 5.1 MeV tritium nuclei are emitted. No additional particles were perceived. The error in the energy deduction to be approximated +/- 10% [1, 10, 11].

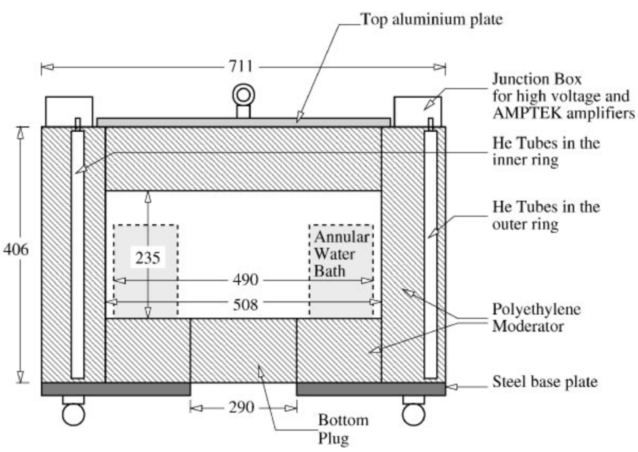


*Figure 1. The cross-view of the detector with the annular water vessel used in the cold fusion experiments (units are mm) [7].*

The finding importance is that at most one nuclear reaction implying the experimentally obtainable nuclei can generate tritons of this energy and as well form no additional charged particles -- and this reaction needs a strange proviso with a view to interpreting the finding [1]:

$$3d + e \rightarrow 2t + \nu + 9.505 \text{ MeV} \quad (1)$$

The condition is that little or no kinetic energy is taken away by the neutrino [12]. This proviso may at best significate that the electron-neutrino reaction takes place throughout a practical operation, and the neutrino is emitted from the reaction volume at very low energy before the full three-particle reaction happens [13]. On the other hand, the neutrino, being the lightest particle, would take away most of the kinetic energy. Not long ago similar mechanism has been proposed [14, 15]. This sequence may be in the form [1]:

$$(d + e) + 2d \rightarrow (2n + \nu)^{*} + 2d \rightarrow 2t + \nu + 9.505 \text{ MeV} \quad (2)$$

In this mechanism, the low energy neutrino does not share in the nuclear energy liberation, so that the two tritons share equally the reaction Q giving each an energy of 4.753 MeV - inside the experimental error band of the measured value [1, 16-18].

The major importance of the test is that it reveals that it is requisite to mention the weak interaction (creation of a neutrino) to account for the data [1].

In 1993, Russell [1] affirmed that it is vastly accepted that some side of our current comprehension of nuclear physics has to be modified with a view to perceive the pathways of the cold fusion method. The triton experiment establishes that at the basic level, any interpretation has to consider the weak interaction appearing at low energies and time scales which are not harmonious with the existing explanation of neutrino behavior [19]. Because the massless neutrino-nucleon cross-section goes to zero with the energy, there is evidently no foundation for taking into consideration a reaction, which forms a very low energy neutrino. Nevertheless, there is growing evidence that the neutrino has a small rest mass. As a massive particle does not inevitably possess a vanishing cross section at zero energy, the presence of a neutrino rest mass possibly furnishes the foundation for explaining how the weak interaction appears in cold fusion [20, 21].

Considering a finite neutrino-nucleon cross section, at very low energy, conducts obviously to additional hypotheses [1].

The likelihood of a deuteron practically catching its orbiting electron is equivalent to the likelihood of producing a neutrino state, which is coming back to the nucleus so that the extreme violation of energy does not last too long [22]. The likelihood of generating such a state in free space is very low. Nevertheless, in a completely symmetrical lattice of titanium and deuterium, the likelihood of constituting the returning state is increased by neutrino backscattering from the lattice. This is a consequential procedure; thus, the scattering probability is proportional to the square of the number of nucleons inside around one neutrino wavelength of the nucleus. Following practicable hypotheses, this would be perhaps $10^{12}$ nucleons. The square of that number is sufficiently great to lead to important backscatter if the neutrino cross-section does not disappear at zero energy. In other words, if the very low energy neutrino-nucleon cross-section is sufficiently big, in that case, many times per year each deuterium atom in a lattice would form a short-lived virtual state consisting of a di-neutron and a very low energy neutrino. Relying on lattice dynamics, probably, the dineutron may take one or more deuterons. The above triton reaction (Eq. 2) obviously needs the di-neutron to take two deuterons with the neutrino simply being a spectator. The nuclear binding energy is carried off by the kinetic energy of the two tritons [1].

The concurrent fixation of two deuterons by the di-neutron must be a rare event needing special lattice loading events [23]. This would be in keeping with the low count rates recorded in the experiment [24]. Further, this three-particle reaction cannot be involved in the excess heat mentioned in some cold fusion tests because the energetic tritons would form distinctly detectable secondary radiations that are not detected [25]. In the same way, this reaction cannot be the only one that generates tritium, as the energetic tritons in passing through deuterium in the lattice would form 14 MeV neutrons in sufficient amount to surpass the detected neutron/tritium ratio by several orders of magnitude [1, 26-28].

## 2. Cold Fusion Rides Again

Around 2007, cold fusion experts affirmed that they possess solid proof that ambient temperature fusion is genuine [29]. Daviss [30] wrote a review and given a short history of cold fusion (Table 1).

***Table 1.*** *A short history of cold fusion [30].*

| Year | Event |
|---|---|
| 1984 | Martin Fleischmann and Stanly Pons begin trials with electrolytic cells. |
| 1989 | Fleischmann and Pons [3] announce excess heat formation that they affirm indicates cold fusion is happening.<br>Electrochemists Pamela Mosier-Boss and Stanislaw Szpak at US Navy's Warfare Systems start tests.<br>A panel of researchers designated by the US Department of Energy renounces cold fusion. |
| 1989-1992 | Melvin Miles at Naval Air Warfare Center, China Lake, California, attempts to reproduce Fleischmann and Pons's work, with diverse conclusions. |
| 1998 | Szpak and Mosier-Boss report proof for tritium generation in cold fusion cells. |
| 2002 | US Navy publishes a declaration on its proof for cold fusion. |
| 2005 | Szpak and Mosier-Boss report presence of other elements as evidence of nuclear reactions. |
| 2007 | Szpak and Mosier-Boss report proof for particle tracks. |

In 2013, the 18th International Conference on Cold Fusion (ICCF-18) revealed augmenting scientific focus on cold fusion, first observed in the paper of Fleischmann and Pons [3] in 1989 [31]. The Conference exhibited fresh experimental data on cold fusion and likely theoretical explanations of these findings were provided. It is expected that a step forward in the official approval of cold fusion may occur during this decade (Figure 2).

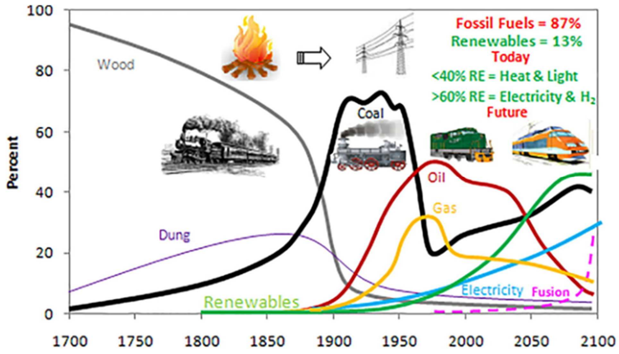


***Figure 2.*** *Great energy transition from fire to the wire [29].*

As mentioned previously, in many tests on low-energy accelerators, it has been shown for some cases that an augmentation in the likelihood of DD fusion reactions happens, as compared to their calculated value, when a target deuterium atom is implanted in metallic crystals [31-33]. This impact is not detected in situations where the target deuterium atom is free or implanted in semiconductors, insulator-crystals, or amorphous bodies. The supposed electronic screening potential $U_e$, which, in the case of the collision of free deuterium atoms, is around 27 eV and considerably characterizes the size of the unexcited deuterium atom, is equal to about 300-700 eV in the case of DD-fusion in a metal crystal environment [31]. This implies that in a conducting crystal media, deuterium atoms can converge without Coulomb repulsion at a distance of 1/10-1/20 of the nominal dimensions of these atoms [31].

As concluded by Tsyganov et al. 2019 [32], the scientific community's acclimatization to fresh learning is certainly not simple. The actual model of physics does not hold up impacts like cold nuclear fusion. The status is confused by the reality that the challenging and costly trials to discover an answer to the issues of monitored thermonuclear fusion, which have continued for more than half a century, have gone too far for a quiet termination. The most well-known trial for thermonuclear fusion is an International Project ITER (International Thermonuclear Experimental Reactor, Cadarache, France) [34]. In fact, the Project is large and very costly. It is evaluated that the assembly of the ITER reactor and the probability of its starting will be finished no earlier than 35-50 years [31].

Cold fusion is a true option [35-37]. The general admission of the technique of cold fusion will take place in the next years [38, 39]. There is an actual scientific foundation for it (Table 2) [31, 40].

***Table 2.*** *The nuclear family [41].*

| | |
|---|---|
| Nuclear fission | Nuclear fission implies splitting up heavy atomic nuclei into smaller ones. The energy from these releases powers all nuclear power stations in operation today. |
| Nuclear fusion | Nuclear fusion releases energy by joining up light atomic nuclei such as hydrogen and helium, the process that at huge temperatures powers the sun. So far, fusion has only been achieved on any scale on Earth in the uncontrolled environment of the hydrogen bomb. |
| Cold fusion | Cold fusion is the controversial idea that high temperatures are not required for nuclear fusion: it can be achieved at or close to room temperature. |

## 3. Cold Fusion Energy for Water Treatment Distillation

This paper offers the idea of employing energy generated from the cold fusion process in water treatment distillation. There is no doubt that solar energy remains the greenest one [42, 43]. However, the great energy emancipated from the cold fusion process proposes its employment in the distillation technique to gain energetic performance in the matter of both cost and time. In fact, this work presents only a pure idea shared at its birth stage. Great work remains to be accomplished with a view to present the cold fusion process as an eco-friendly technology for producing energy for water treatment distillation. Moreover, green cold fusion as an energy source for water treatment distillation may be considered as a promising perspective. The term "green" means, however, here a process without any nuclear hazards and pollutions [44-46]. The safety and environmental aspects are well discussed by Ongena and Ogawa [34].

## 4. Conclusion

This review suggests the perspective of the cold fusion as an energy source for water treatment.

1. Employing the concepts of cold fusion, the power plants possess distinctive benefits over the still hypothetical thermonuclear fusion. With a large success, compact cold fusion set-ups will be utilized on ships, in aircrafts, and in near and outer space travels. That, in principle, is inaccessible for the giant thermonuclear installations. These optimistic perspectives suggest promising future for employing cold fusion in generating energy for water treatment distillation.
2. The event of low-temperature cold fusion was detected while investigating materials with elevated solubility of hydrogen isotopes, namely, palladium, titanium, and some other alloys and substances. Undoubtedly, the intrinsic features of a metallic matrix are responsible not only for the capacity of a material to accumulate deuterons but also for the possibility of deuteron nucleus to move and interact. That is why the processes occurring during the cold fusion should be sensitive to the structure of metals and alloys applied.
3. For using cold fusion in water treatment industry, this is only an idea presented at its birth stage. Great work remains to be accomplished with a view to present the cold fusion process as an eco-friendly technology for producing energy for water treatment distillation. In fact, greening cold fusion as an energy source for water treatment distillation may be considered as a promising perspective. However, the term "greening" means here a process without any nuclear hazards and inherent pollutions.

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